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09/606,252	06/28/2000	Raminda U. Madurawe	A293D	5633

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EXAMINER

BROCK II, PAUL E

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 04/15/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/606,252

Applicant(s)

MADURAWA ET AL.

Examiner

Paul E Brock II

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the depositing a field implant, depositing a well implant and depositing an enhancement implant are done using a single mask; the blocking the well implant and the enhancement implant; and the enhancement implant and the pocket implants in the same embodiment must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 21 – 26 and 41 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

With regard to claims 21 – 26, it is not clear how a single mask can be used to accomplish depositing a field implant, depositing a well implant and depositing an enhancement implant. Further, it has been stated on page 10, lines 6 – 10 of the originally filed application “Using a single p-well mask, by varying the energy levels and dopants, any of the three elements are formed.” One of ordinary skill in the art would have no basis of knowing what energy level or what type of dopants could or should be used for performing any of the three implants as disclosed and claimed by the applicant. It would require unnecessary experimentation to simply begin to understand the use of a single mask in implanting these three impurity regions. For example, while it is understood that the figures are only a representation of the invention, how does one mask so clearly define a field implant that extends beyond the boundaries of a p-well? Even with the explanation that different energies are used there seems to be no way to create such a continuous and consistent field implant under an isolation region where a p-well apparently has a boundary before the field implant ends. It would at first appear that this boundary is formed by the mask that the applicant claims, however, if this is so, the field implant would have the same boundary and would be visible in the figures at a depth that is less than the p-well.

4. Claim 41 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. It is not clear where in the originally filed specification support for “the first

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pocket implant is separated from the second pocket implant by approximately 0.35 microns” can be found.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 27 – 34 and 38 – 41 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. The term "near" in claims 27 and 38 is a relative term which renders the claim indefinite. The term "near" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably appraised of the scope of the invention. In claim 27 it is not clear what proximity the first and second pocket implants are to each other as defined by the term “near”. What proximity does “near” define a relationship between the first pocket implant with and the second pocket implant? In claim 38 it is not clear what proximity the pocket implants are to the semiconductor substrate surface as defined by the term “near”. What proximity does “near” define a relationship between the pocket implants with and the semiconductor substrate surface? Near, as compared to what?

8. The phrase “a small distance” in claim 27 is a relative phrase. What value or relationship does “a small distance” define? A small distance compared to what?

9. With regard to claim 41, the term "approximately" in claim 41 is a relative term which renders the claim indefinite. How is the first pocket region separated from the second pocket region by approximately 0.35 microns? How close to 0.35 microns is approximately?

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

11. Claims 27, 29 – 31, 33 – 36, 38 and 40 – 41 are rejected under 35 U.S.C. 102(e) as being anticipated by Kao et al.

With regard to claim 27, Kao et al. discloses in figure 2a – 2g a method of fabricating a transistor in an integrated circuit device. Kao discloses providing a semiconductor substrate (204), forming a gate oxide (206) on the semiconductor substrate and forming a gate (210) on the gate oxide in figure 2a. Kao discloses in figure 2c implanting a first pocket implant (222 and 214) into the semiconductor substrate from a first side of the gate. Kao discloses in figure 2c implanting a second pocket implant (222 and 216) into the semiconductor substrate from a second side of the gate. Kao discloses in figures 2c – 2g that the first pocket implant is near and separated by a small distance from the second pocket implant.

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With regard to claim 29, Kao et al. discloses in column 4, lines 53 – 56 the first pocket implant and the second pocket implant are implanted at an angle.

With regard to claim 30, Kao et al. discloses in column 4, lines 45 – 49 the first pocket implant and the second pocket implant are implanted using the gate as a mask.

With regard to claim 31, it is inherent in the method of Kao et al. that the diffusing increases a reverse short channel effect of the transistor.

With regard to claim 33, Kao et al. discloses in column 5, lines 13 – 32 forming a source on the first side of the gate and a drain on the second side of the gate, wherein the source and drain are doped at a first polarity and the first pocket implant and the second pocket implant are doped at a second polarity.

With regard to claim 34, Kao et al. discloses in column 5, lines 13 – 32 that the first polarity is different than the second polarity.

With regard to claim 38, Kao et al. discloses in figures 2a – 4b providing a semiconductor substrate. Kao et al. discloses in figures 2a – 4b forming a gate oxide on the semiconductor substrate. Kao et al. discloses in figures 2 a – 4b forming a gate on the gate oxide. Kao et al. discloses in figures 2a – 4b, column 4 lines 53 – 67, and column 5, lines 1 – 3 and 33 – 50 implanting a first pocket implant into the semiconductor substrate from a first side of the gate at an angle. Kao et al. discloses in figures 2a – 4b, column 4 lines 53 – 67, and column 5, lines 1 – 3 and 33 – 50 implanting a second pocket implant into the semiconductor substrate from a second side of the gate at an angle. Kao et al. teaches in figures 2a – 4b that the concentration of pocket implants under the gate is non-uniform, and the pocket implants extend near the semiconductor substrate surface.

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With regard to claim 40, Kao et al. discloses in figures 2a – 4b, column 4 lines 53 – 67, and column 5, lines 1 – 3 and 33 – 50 wherein the first pocket implant and the second pocket implant are implanted using the gate as a mask.

With regard to claim 41, Kao teaches in figures 2a – 4b that the first pocket implant is separated from the second pocket implant by approximately 0.35 microns.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 21 – 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (AAPA) in figures 2A and 2B in view of the AAPA in figures 1A and 1B and one of ordinary skill in the art.

The AAPA teaches in figures 2A and 2B depositing a field implant (120). The AAPA teaches in figures 2A and 2B discloses depositing a well implant (140). The AAPA teaches in figures 1A and 1B discloses depositing an enhancement implant (130). The applicant admits in the arguments filed February 22, 2002 that one of ordinary skill in the art would appreciate that at least Figures 2A and 2B show how [the three types of implants may be done using a common p-well mask] may be done.” and therefore depositing a field implant, depositing a well implant, and depositing an enhancement implant using a single mask is obvious.

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14. Claims 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kao et al. as applied to claims 27 above, and further in view of Gilgen et al.

Kao et al. does not disclose implanting an enhancement implant. Gilgen et al. teaches in figure 8 and column 6, lines 56 – 62 implanting an enhancement implant in the semiconductor substrate. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the enhancement implant of Gilgen et al. in the method of Kao et al. in order to adjust the threshold voltage of a device as stated by Gilgen et al. in column 6, lines 56 – 62.

15. Claims 21 – 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilgen et al. in view of Stolmeijer et al.

Gilgen et al. discloses in figures 1 and 6 – 8 a method of fabricating an integrated circuit. In figures 7 and 8 Gilgen et al. discloses depositing a field implant (62). In figure 1 Gilgen et al. discloses depositing a well implant (15). In figure 8 Gilgen et al. discloses depositing an enhancement implant. Gilgen et al. does not disclose depositing a field implant, depositing a well implant, and depositing an enhancement implant using a single mask. Stolmeijer et al. teaches in figure 1, column 6, lines 45 – 68 and column 7, lines 1 – 50 using a single mask to do three separate implants. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the method of Stolmeijer et al. to deposit the three implants using a single mask. Stolmeijer et al. teaches that the well implant is an n-well.

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With regard to claim 23, Gilgen et al. does not disclose the well implant as an n-well. It is well known in the art to use the same process to form an n-well or a p-well by simply changing the dopant. The process is the same while the result is different. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use a p-well implant instead of an n-well implant in order to create an n-channel gate instead of a p-channel gate.

16. Claim 24 rejected under 35 U.S.C. 103(a) as being unpatentable over Gilgen et al. in view of Stolmeijer et al. as applied to claim 21 above, and further in view of Icel et al.

Gilgen et al. in view of Stolmeijer et al. does not disclose forming a high voltage native transistor. Icel et al. teaches in figure 3 forming a high voltage native transistor (45) by blocking a well implant (13) and an enhancement implant, as stated in column 7, lines 25 and 26, and offsetting the field implant (48) from an active area of the native transistor, thereby obtaining high gated-diode junction breakdown characteristics. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the formation of a native transistor of Icel et al. in the method of Gilgen et al. in view of Stolmeijer et al. in order to have a native transistor with threshold voltage around 0 volts as stated by Icel et al. in column 7, lines 26 and 27.

17. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilgen et al. in view of Stolmeijer et al. as applied to claim 21 above, and further in view of Kao et al.

Gilgen et al. in view of Stolmeijer et al. does not disclose implanting a pocket or depositing two pocket implants. Kao et al. teaches in figures 4a and 4b, and columns 6 and 7,

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lines 43 – 67 and 1 – 9 the use of pocket implants. In figure 4a Kao et al. teaches implanting a pocket implant (460) to improve a punch-through immunity. In figure 4b depositing two pocket implants and merging the pocket implants together (460). It is inherent that the pocket implants of Kao et al. are merged together by lateral diffusion, whereby a channel doping profile from the pocket implant diffusion exhibits reverse-short-channel effect. It would have been obvious at the time of the present invention to use the pocket implant method of Kao et al. in the method of Gilgen et al. in view of Stolmeijer et al. in order to avoid short channel effects as stated by Kao et al. in column 7, lines 16 – 18.

18. Claims 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kao in view of Sanchez (USPAT 5583067).

With regard to claim 35, Kao et al. discloses in figure 2a – 2g a method of fabricating a transistor in an integrated circuit device. Kao discloses providing a semiconductor substrate (204), forming a gate oxide (206) on the semiconductor substrate and forming a gate (210) on the gate oxide in figure 2a. Kao discloses in figure 2c implanting a first pocket implant (222 and 214) and a second pocket implant (222 and 216) into the semiconductor substrate using the gate as a mask. Kao teaches that the pocket implants are boron implants. Kao is silent to the fact that the first pocket implant and the second pocket implant laterally diffuse in the semiconductor substrate. Sanchez teaches in column 7, lines 40 – 45 lateral diffusion of boron. It would have been obvious to one of ordinary skill in the art at the time of the present invention for the pocket implants of Kao to diffuse laterally such as the implants of Sanchez because later process steps will facilitate the diffusion as stated by Sanchez in column 7, lines 40 – 45. It is therefore

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obvious that Kao et al. has diffusing of the first pocket implant and the second pocket implant laterally as shown in figures 4a and 4b the first pocket implant obviously merges with the second pocket implant due to the implant conditions of the original implants and the later processing.

With regard to claims 36, Kao et al. and Sanchez teach that the diffusing inherently increases a reverse short channel effect of the transistor.

19. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kao et al. and Sanchez as applied to claims 35 above, and further in view of Gilgen et al.

Kao et al. and Sanchez do not disclose implanting an enhancement implant. Gilgen et al. teaches in figure 8 and column 6, lines 56 – 62 implanting an enhancement implant in the semiconductor substrate. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the enhancement implant of Gilgen et al. in the method of Kao et al. in order to adjust the threshold voltage of a device as stated by Gilgen et al. in column 6, lines 56 – 62.

20. Claims 28 and 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kao et al. as applied to claims 27 and 38 above, and further in view of Sanchez.

With regard to claim 39, Kao et al. discloses in column 3, lines 9 – 11, column 4, lines 53 – 67, column 5, lines 40 – 50 and column 6, lines 61 – 67 implanting the first pocket implant and the second pocket implant at angles into the semiconductor substrate. Kao is silent to the fact that the first pocket implant and the second pocket implant laterally diffuse in the semiconductor substrate. Kao teaches that the pocket implant is a boron implant. Sanchez teaches in column 7,

lines 40 – 45 lateral diffusion of boron. It would have been obvious to one of ordinary skill in the art at the time of the present invention for the pocket implants of Kao to diffuse laterally such as the implants of Sanchez because later process steps will facilitate the diffusion as stated by Sanchez in column 7, lines 40 – 45.

Response to Arguments

21. Applicant's arguments filed 6-28-2000 have been fully considered but they are not persuasive.

22. The arguments with respect to the 112 rejection of claims 21 – 26 relating to a common p-well mask used to define a field implant, a well implant and an enhancement implant are not persuasive. The applicant states that “one skilled in the art would appreciate that at least Figures 2A and 2B show how this is done.” It is not clear how figures 2A and 2B could show how these three implants are performed using a single mask because only the p-well and the field implants are shown in the figures. The applicant's recitation that “the enhancement implant region 135 is shown.” is clearly in error as reference numeral 135 is showing the channel area, not an implant. Further, on page 5, lines 16 – 24 the applicant specifically states that the transistors (200 and 250) in figures 2A and 2B, respectively, are native transistors and that “the term ‘native transistor’ refers to a transistor [that] is not implanted with the enhancement implant.” Figures 1A and 1B clearly show that reference numeral 130 has been designated as an enhancement implant. The applicant further argues that “Where field implant is not slowed by the isolation regions, that is between the isolation regions 150, the field implant is relatively deep, and is not shown.” This is clearly in error as the p-well has clearly been shown at the same depth both

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under the isolation regions and between the isolation regions, which would lead one of ordinary skill in the art to believe that an implant that stops just below the isolation regions would be of less energy than one that stops at a depth of the p-well below the isolation regions. In other words, one of ordinary skill is left to wonder why the field implants are not shown at some depth under the area between the isolation regions at a shallower depth than the p-well implants are shown. If only one mask was used for all of the implants it is clear that the field implant is not further below the p-well implant at any point. Finally, the applicant has explained that it is possible to make these three implants using a single mask but fails to disclose a position of a mask during any of the three implants. Arguments can not be read into the specification and without undo experimentation one can only come to the conclusion that support for these 3 implants using a single mask is not given in the originally filed specification.

With regard to claims 21 – 26, the arguments drawn toward the §103(a) rejection, the applicant argues that “Stolmeijer et al. in figure 1 shows the use of mask 8 for two implants.” A review of figure 1, column 6, lines 45 – 68 and column 7, lines 1 – 50 of Stolmeijer et al. clearly describes three implants (10, 11 and 14) defined by a single mask (8).

With regard to claim 35, the applicant argues that in Kao et al. “these figures do not show two pocket implants, rather they show a single implant 432.” The only disclosure that Kao gives of forming the pocket implants are through angled implants. In this process two implanted regions are always formed on either side of the gate. In the case of figures 4a and 4b of Kato the one represented pocket region has to be the result of diffusion of the two separate pocket regions during and after the implantation. There is no other possibility that is consistent with the disclosure of Kao.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703)308-6236. The examiner can normally be reached on 8:30 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703)308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
April 9, 2002



EDDIE LEE
SUPERVISORY PATENT EXAMINER
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